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and he made no distinction between contemporary or well known botanists and the young or obscure. Many of the younger generation of botanists remember his kind words of encouragement and sympathy and are grateful for his criticisms, which were always made in a kindly spirit, without cynicism or ill-nature. His long and active life came gradually to a close, without physical suffering or mental decrepitude. It was the privilege of the writer to meet him in his library surrounded by his books only a few months before his death, and, although he had become somewhat deaf, it was hard to believe that he was so far up in the eighties, for he showed the same intelligence and the same interest in what was going on in the botanical world as he had shown twenty years before.

A list of the botanical writings of Alphonse de Candolle will be found in the *Revue Générale de Botanique,* Volume V., pages 200–208.

1893. W. G. Farlow.

AUGUST WILHELM VON HOFMANN.

August Wilhelm Hofmann, a Foreign Honorary Member of the Academy, was born in Giessen, April 8, 1818. His childhood passed quietly in his native place, and in its schools he was fitted for its University, at that time famous for the laboratory which Liebig had established in the old guard-house, and in which chemistry was first taught by experiment. It is not strange, therefore, that, after paying attention for a short time to other studies, Hofmann was attracted to chemistry and entered the laboratory. Here he soon became one of the most eminent among that company of students, including the picked men from all civilized countries, as his first researches, which related to the identity of aniline obtained from different sources, showed a grasp of the subject, a chemical insight, and a skill in experiment remarkable in so young a man. He also had the good fortune in the course of them to discover the chloranilines, the formation of which could not be brought into harmony with the dualistic theory then at the height of its dominion, and this brought his work prominently to the notice of the chemical world.

In 1840 Liebig took him as his private assistant, when it became his duty to do part of the editorial work on the "Annalen der Chemie und Pharmacie"; and this early literary training undoubtedly was a principal cause of the ease with which he handled his pen in later years. He stayed in Giessen until the spring of 1845, and all this time his intimacy with Liebig was growing closer and closer; he worked with him in the laboratory during the week, and frequently accompanied him on Sunday excursions or vacation journeys. To the end of his life he could not speak with too much affection and gratitude of his great teacher.

From Giessen he went to Bonn to lecture on agricultural chemistry, but before the year was out accepted a call to the directorship of the Royal College of Chemistry, which was to be founded in London after the plan of Liebig's laboratory at Giessen; and in October, 1845, he opened the laboratory of this institution, where he remained for twenty years.

There could be no better proof of Hofmann's ability and force of character than his success in this position, the difficulties of which were enormous. It was necessary to establish a laboratory, and organize a course of chemical instruction, at a time when the details of experimental teaching of chemistry had been only partially worked out, and this was to be done by a German suddenly plunged among Englishmen, with whose national feelings he must bring himself into harmony so as to adapt his plans to the environment; and, what was harder still, it was necessary that these plans should satisfy the subscribers on whom the venture rested for support. After the successful launching of the enterprise, during which he invented many of the methods of laboratory teaching since in common use, he was further embarrassed by a loss of interest on the part of these subscribers, whom it was necessary to arouse and recruit by a series of popular lectures, and to conciliate by doing technical work for many of them without charge. At the same time his own means were very slender. I well remember the humor with which he told a story of lighting the gas accidentally with a five-pound note at this period, and feeling an ache in his bones from it for a week. Later, however, thanks principally to his discoveries among the aniline dyes, this evil was remedied, so that he was never again in want of money, and the Royal College of Chemistry, after he had steered it successfully through these troubled waters, was put on a solid basis as a state institution under another name.

In addition to the duties already mentioned, he was frequently required to give scientific advice to the government, and served on the jury at most of the great exhibitions. He was also a prominent member of the London Chemical Society,—Foreign Secretary as early as 1847, and President in 1861; in 1856 he was appointed Master of the Mint. With these varied activities and the numerous distractions caused by the brilliant scientific society of London at this time, it is surprising that he should have produced a very large volume of scientific work of the highest quality; but the riddle is solved by his statement that he often worked in the laboratory till two or three o'clock in the morning, and in this way succeeded in getting through an amount of work which would have broken down a man with a less robust constitution.

After twenty years of this life, in spite of its pleasures and honors, he began to turn his eyes toward Germany again, and at first intended to go to Bonn, where the laboratory was built under his direction; but before leaving London to take charge of it, his destination was changed by a call to Berlin, where he became Professor in 1865, and at once set to work with his accustomed energy to reorganize the chemical department of the university, which had fallen into some disorder, and to build the large laboratory, which was finished in 1869. The site was chosen so that the laboratory could be connected with a house which had been for many years the property of the Prussian Academy, and was used as the dwelling of both its chemist and astronomer, until the astronomer was removed to other quarters shortly before Hofmann's arrival, and the chemist of the Academy left in undisputed possession; to this post Hofmann succeeded in virtue of his appointment as Professor of Chemistry in the Berlin University, and here the last years of his life were passed in happy activity.

In term time he gave three lectures a week, each lasting two hours, — a severe tax on the strength of any man, especially in the hot, close weather of a Berlin July. Then he went into the laboratory and visited his private assistants, of whom he sometimes had as many as six, and his advanced students. This filled the morning. The afternoon was devoted to work in his private laboratory, or a second visit to his students; and in the evening, after supper between half-past eight and ten, he passed a short time with his family, and then at about eleven settled down to work in his study till from one to three in the morning. As in London, he added to his regular work a great many other occupations. He was the father of the German Chemical Society, founded in 1867, which under his care has grown to such enormous proportions. His services as a juror at the great exhibitions were still in frequent demand, and he issued an elaborate report on the chemistry in that of Vienna, which amounted to a full statement of the condition of technical chemistry in the year 1873. In his literary work a large place is filled by his historical accounts of the earlier chemists and the alchemists of Berlin, and also by numerous obituaries of his distinguished contemporaries, many of which toward the end of his life he collected into three large interesting volumes. To these should be added his "Introduction to Modern Chemistry, Experimental and Theoretic," a short text-book brought out at the beginning of his life in Berlin, which gave a remarkably clear account of what were at that time the new theories, illustrated by ingenious and novel lecture experiments. His brilliancy as a lecturer led to his giving many public lectures, notably the Faraday Lecture of the London Chemical Society in 1875, — a life of Liebig, which was afterward published in book form.

He did not seek for honors, and frequently expressed the slight value he set upon titles, but they came to him unsought. At the beginning of 1875 he received the honorary title of Privy Councillor (*Geheimrath*), and in 1890 he was ennobled.

In his vacations he was a great traveller. There was hardly a country of Europe which he had not visited, and in the summer of 1883 he travelled over most of the United States, when his eager interest in all that he saw, and his delighted appreciation of American humor, left pleasant memories to those who were fortunate enough to meet him.

The busy life which I have described, continued with only one serious interruption from sickness (in 1878), until he was seventy-four years old, when the end came suddenly on the 5th of May, 1892. He had just begun to lecture again with his accustomed energy, after his return from a short vacation journey, when on coming home from a faculty meeting he began to feel unwell, and in half an hour was dead, — a fortunate end to a happy life.

My first sight of Hofmann was characteristic of the man; it was in the chemical lecture-room, just after the academic quarter of an hour had ended. He came hurrying in, wearing a white knit scarf about his throat, and a tall hat. With what seemed to be a single motion, he took them off and laid them on the table; then plunged into his lecture, rather quietly at first, but gathering energy as he went on, until he carried all along with him in the rush of his ideas. Not that he talked very fast, but his lecture seemed like a broad rapid stream, flowing with irresistible force. When he grew excited, he had a curious gesture, apparently taking the words from his mouth and throwing them at his audience with the whole strength of his body. His style was clear, vivid, and picturesque, his experiments striking and apt, since he had a rare faculty for contriving them, and was usually most successful in carrying them through; but if, as rarely happened, an experiment did not go well, or an assistant was slow in his work, he would fairly dance with impatience.

In the laboratory it was much the same. In his tall hat and the invariable knit scarf, he hurried up to a student, and called out almost as soon as he was within hearing, "What have you got to show me to-day?" Then, if the new substance crystallized well, — "This is a beautiful substance, a superb substance. We will make a couple of experiments with it." After which came a host of watch-glass experiments, leading deep into the subject, all done with the same dash and enthusiasm. But if the student had not enough clean watch-glasses, or did not answer his questions quickly enough, he in his impatience shook his knees with a peculiar sideways motion, — a most alarming gesture, which also greeted the man who had not looked up all that had been done on his subject, and did not have his knowledge at his fingers' ends. This mode of teaching was terrible for shy, nervous men; but for others it was wonderfully inspiring, and all his students realized that this impatience was only the overflow of his superabundant energy, and in no way allied to bad temper. He was, in fact, one of the kindest of men, and took the strongest personal interest in his students, adopting their successes or failures in the laboratory as his own; and when they were in misfortune he was always ready with his help, whether in advice, sympathy, or money, as I have the best reason to know.

The energy which charaterized his teaching also appeared in his researches. A rough count shows that at least three hundred and fifty-eight papers bear his name; but even this number does not give a just idea of his productiveness, since probably as many, or even more, papers were published by his students under their own names, and these in most cases were as much his work, except so far as mere manual labor was concerned, as those included in the number given above.

A general direction was given to Hofmann's work by his first research in Liebig's laboratory, which consisted in proving the identity of three substances, — benzidam from nitrobenzol, and aniline and krystalline obtained in different ways from indigo. He also showed that this substance (aniline) was contained in the mixture of bases extracted from coal tar by Runge, and called by him kyanol. This called his attention to the compounds of nitrogen, and in this class of bodies his most important discoveries have been made. First among these must be placed his work upon the aniline dyes, on account of the great industry to which it has given birth; for although he had many competitors in this field, and was not the first to introduce an aniline color into commerce, his discoveries are so fundamental and various that he can be justly called the father of this industry. This work grew naturally from his first research just mentioned, since rosaniline, the most important of these dyes, is easily made by the oxidation of crude aniline. This substance was first satisfactorily investigated by him, although it had been obtained earlier by others, and he brought our knowledge of it into such a state that it could be manufactured on a commercial scale. From this rosaniline (magenta dye) he soon showed that different colors could be obtained by replacing part of its hydrogen by other radicals; and in this way he made violets and blues of a brilliancy unknown before, which, with a vivid green that soon followed, at once came into general use. It may be added, that an investigation made under his direction laid the foundations for preparing aniline itself on an industrial scale. This work dates from his London period, and some idea of the excitement of that time can be gained from the fact that he reported the results of his analysis of aniline blue to the French Academy by telegraph, probably the only time that a paper has been communicated in this way.

Another discovery of his, although not yet of technical value, is even more important to chemists than the work just mentioned. This is the method of preparing the amines by the action of ammonia on alkyliodides or bromides, which alone would have been sufficient to make him great, as by it not only were three of the most important classes of chemical compounds discovered, — the secondary and tertiary amines, and the substituted ammoniums, — but also this discovery had a great, an almost decisive influence on the adoption of the present chemical theories. This was one of his earliest researches, and it is interesting to note that in the later years of his life he added still another way of preparing primary amines to the meagre list of known methods; it was by the action of bromine and water upon the amides, and has rendered these very expensive substances more accessible.

Another discovery, the displacement by heat of hydrocarbons from substituted ammonic hydrates, dates also from his later years, and promises to be of the first importance, since it has already done much, and will do more, to solve the perplexing riddle of the constitution of the natural alkaloids.

Of his other important discoveries I shall not attempt to speak in detail; they include syntheses of the mustard oils and guanidine, with the working out of the constitution of these products of life; the migration of alkyl radicals from nitrogen to carbon under the influence of heat, an interesting observation which has been of great value in the color industry; and researches on the isonitriles, cedriret, orthoamidomercaptans, cyanuric acid, the ethylene bases, and many other substances natural and artificial. And here should also be mentioned the new forms of apparatus contrived by him, especially that for determining vapor densities, and the eudiometers and other pieces of lecture apparatus to which I have alluded earlier.

In the preceding description of the man and his work I have tried to portray his vigorous, enthusiastic energy, and his exceeding kindliness, which also appeared in his family life, making him at the same time a most affectionate and ambitious father. His wonderful inventiveness and intellectual power also have been sufficiently shown by the account of his discoveries, and his great administrative ability by his success in organizing and carrying on the large chemical laboratories of London and Berlin. The picture of Hofmann would be incomplete, however, without mention of his breadth of character. He always deplored the unfortunate quarrel between German and French chemists, which followed the Franco-Prussian war, and through it all kept up the most friendly relations with the leaders of French chemistry. An even better proof of this absence of all littleness in him is found in the fact that he would receive information or take corrections even from his students, saying, "I am willing to learn from any one."

He was simple and temperate in his habits of life, and fond of innocent jokes and amusements. He had a remarkable faculty for languages. On one occasion, at an international chemical dinner, he made speeches in five languages, — German, English, French, Italian, and Spanish. In person he was of middle height, with an extraordinary depth of chest, and a figure massive rather than either large or stout. His forehead was high, crowned with waving hair, and in his earlier days he wore a mustache and small pointed beard, afterwards replaced by a full beard.

He has left very tender and affectionate memories in the hearts of a multitude of students, who will remember their chemical father as long as they live; and when all of these are gone, his works will still stand, his enduring monument.

1893. CHARLES LORING JACKSON.

SIR RICHARD OWEN.

WHEN SIR RICHARD OWEN died, full of years and honors, on December 18, 1892, the last prominent representative of the old school of comparative anatomists passed away. For about fifty-six of his eighty-eight years he was actively devoted to the science which he loved so well and served so truly. Born at Lancaster on July 20, 1804, he took his medical diploma at the Royal College of Surgeons in 1822, and began the practice of medicine. His dissections when a student had attracted the notice of Abernethy, who procured for him the work of cataloguing the preparations of the Hunterian Museum in 1828. The consequences of this appointment were momentous both for him and for science. It brought him into the intimacy of a relative of John Hunter, Mr. Clift, who was then the chief Curator. Owen married his daughter, and thus naturally, as it were, became the follower of the renowned founder of the Museum. Hunter's mantle could not have fallen on worthier shoulders. It is easy to conceive that an office so attractive to an anatomist boded no good to his success as a practitioner. In a few years he withdrew from the profession he had first chosen, to devote himself wholly to science. In